

CONSUMERS' PERCEPTION OF MILK SAFETY

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ABSTRACT

Several times during the last decade consumers have been warned about different incidents concerning food safety, like, salmonella in eggs, cheese and poultry, and pesticides residues in tomatoes. The problem of food safety is still to be a largely latent concern for consumers. The main research goal of this paper is to investigate consumers' risk attitudes and risk perceptions concerning milk safety and to estimate their willingness to pay for extra-safe milk. The data was collected in the Netherlands using a mail survey. 211 usable questionnaires (26%) were returned. Results show that, in general, consumers are not concerned about the safety of milk. However, the results of consumers' perceptions of the "riskiness of milk contamination" for vulnerable groups of people show that babies are considered to be more sensitive to different sources of contamination than other groups. This study supports the results of previous food safety studies showed that consumers are willing to pay a price premium to the traditional purchase price to avoid some perceived risks. 58% of respondents are willing to pay an additional price for extra-safe milk. The conjoint experiment results indicate that the most important factors for consumers' preference are risk of contamination and presence of a label. Based on a conjoint analysis four segments of respondents were distinguished: "Balanced Shoppers"; "Safety-Seekers"; "Safety-Indifferent"; and "Extreme-Safety Seekers".

Key words: food safety, questionnaire survey, risk attitudes, risk perceptions, willingness to pay, willingness to buy.

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INTRODUCTION

During the last decade consumers have been confronted with a number of different food safety incidents. Examples include salmonella in eggs, cheese and poultry, and pesticides residues in apples and tomatoes. Although the problem of food safety is growing for many consumers, at most times it is still a largely latent concern (Senauer, 1991). Instead of looking at food safety, consumers choose food products based on a number of other factors. In addition to the price of the product, quality attributes such as, appearance, convenience, texture, smell and expected taste influence choices made in the marketplace. These quality attributes can be regarded as experience and search attributes, since they can be ascertained on the basis of direct or later actual experience (Steenkamp, 1990).

Food safety on the other hand is a credence attribute, where the consumers can not judge the level of food safety in products they buy and consume, and therefore, have to believe producers (Steenkamp, 1990). Therefore, food safety issues often cause one of the largest and most problematic uncertainties, which complicate the consumers' decision-making process.

On the other hand, producers controlling and improving the level of food safety are confronted with costs. The value of societal and consumers' benefits from reduced probability of health impairment associated with risks should obviously compensate the producers' costs of food safety improvements. A lot of studies have already been done on the cost and benefit side of the food safety problem and on understanding consumers' preferences for safe food. These studies refer to, among others, eggs, seafood products, and tomatoes (Lin and Milon, 1995; Henson, 1996; Akgungor *et.al.*, 1995). Little is known, however, about consumers' risk attitudes and risk perceptions with respect to foodborne diseases and consumers' valuations of the benefits from dairy products safety improvements.

The goal of this paper is to investigate Dutch consumers' attitudes and perceptions of the food safety risks of dairy products and to estimate consumers' willingness to pay for safer dairy products. In our study we focus on milk. The consumption of this product is very important for Dutch consumers in general and especially for vulnerable groups of consumers, like babies, children, pregnant women and elderly. Based on the research goal, the main research questions are: (1) what are consumers' risk attitudes towards milk safety; (2) what are consumers' risk perceptions of milk safety; (3) what are consumers actually willing to pay for milk safety improvements; (4) what are

consumers' attitudes to labelling and certifying organisations; and (5) what consumer segments, based on food safety preferences, can be distinguished.

MATERIALS AND METHODS

Survey design

A mail survey was used to collect the data needed for this study. In order to identify the most salient aspects related to consumers' perceptions and attitudes with respect to the safety of milk, a pilot study has been conducted among 10 people.

The questionnaire for the survey consisted of three sections. These included questions on: (1) milk consumption characteristics, consumers' risk attitudes and risk perceptions of milk safety, consumers' attitudes towards labelling and certifying organisations, consumers' willingness to buy extra-safe milk and consumers' willingness to pay for it; (2) socio-demographic and economic characteristics; and (3) a conjoint task. The attitudinal and perceptual questions were in the form of Likert-type scales ranging from 1 to 5. The question on consumers' willingness to buy were solicited using a four point category scale (1 = "yes", 2 = "probably", 3 = "probably not", 4 = "no"). The willingness to pay question was an open-ended question.

Conjoint experiment

To investigate the trade-off that consumers make during the buying-decision process we used a conjoint experiment. The hypothetical products were defined in terms of combination of levels from three attributes:

- (1) price premium (levels: no price premium, Dfl 0.20 per litre of extra-safe milk, Dfl 0.40 per litre of extra-safe milk);
- (2) chance of contamination (levels: no contamination at all, chance of microbiological contamination, chance of chemical contamination, chance of physical contamination);
- (3) label of certifying organisation to which consumers trust more (levels: yes, no).

The choice of attributes and levels are based on research questions and on the pilot study. Given these attributes and levels there are 24 different hypothetical products. Nine of them were however unrealistic, i.e. if the hypothetical products have a chance of being contaminated, it is not realistic to assume a label. To avoid this problem a new attribute (combined second and third attributes) with five levels was created. The levels of the new attribute are: (1) chance of microbiological contamination and no label; (2) chance of chemical contamination and no label; (3) chance of physical contamination and no label; (4) no contamination and no label; (5) no contamination and label.

The respondents then were asked to rate 15 hypothetical milk products and three additional validation profiles. Respondents rated each product on a scale from 0% (not likely to buy) to 100% (likely to buy). Ratings instead of rankings were used to evaluate the profiles, so that the respondents were able to express indifference among two or more hypothetical products and because ratings are easier in a mail survey.

Data

The questionnaire was sent in November 2001 to 800 randomly selected respondents in the Netherlands. Addresses were selected randomly from 10 telephone books, which were selected also randomly among 50 books covering all phone numbers in the Netherlands. After 7 days a reminder was sent. The survey packet included a cover letter, the questionnaire and a lottery-voucher, worth – Dfl 50.

211 usable questionnaires (26%) were returned within the required time period. Of the returned, 132 were from women and 78 were from men (one subject did not indicate its gender). The majority of respondents consumes milk (97.6%). Most respondents consume pasteurised (28.6%), or half-fat (80.1%) milk. About 30% prefers to drink buttermilk. The majority (60.4%) of the respondents consumes milk 6-7 days per week, 20.8% drinks milk 3-5 days per week, and just about 8.5 % of the respondents drink milk less than 1 day per week.

Methods

Consumers' risk attitudes and risk perceptions related to milk safety and their attitudes to labelling and certifying organisations were studied by descriptive statistics. Factors influencing the willingness to buy were explored by logistic regression (stepwise procedure). To evaluate consumers' willingness to pay a multinomial regression model was used. Based on the conjoint experiment results, a cluster analysis was used to identify consumer segments.

RESULTS

Consumers' risk attitudes towards milk safety

One of the main research questions of this study is about consumers' risk attitudes concerning milk safety. The questionnaire asked the respondents to indicate their concerns about the safety of milk that they buy at different places. About 95% of the respondents buys milk at the supermarket. 47.4% of the consumers who buys milk at the supermarket are not concerned about the safety of milk at all, 17.1% are somewhat unconcerned, and 15.6% are indifferent (see Table 1). The remaining respondents, who buy milk at other places, also did not express concerns about the safety of milk.

Table 1. Consumers' milk safety concerns at different purchasing places (%)

	Not concerned at all	Somewhat unconcerned	Indifferent	Somewhat concerned	Very concerned
Supermarket	47.4	17.1	15.6	8.5	7.6
Special shop	11.8	11.8	3.8	2.4	1.4
At work (lunch-time)	10.4	5.7	8.5	4.7	0.9
At the farm	8.1	2.8	5.7	3.8	2.4

Some population subgroups (babies, children, pregnant women, and elderly) are more vulnerable to foodborne illness. Table 2 shows the results of consumers' concerns about these groups becoming sick after consuming milk.

Table 2. Consumers' concerns about the risk of vulnerable groups becoming sick of milk (1=not concerned at all, 5=very concerned)

	Average Score	Standard Deviation
Babies (0-3 years) ^{abc}	3.06	1.98
Pregnant women ^{bd}	2.85	1.89
Children (4-12 years) ^{ad}	2.68	1.85
Elderly ^c	2.67	1.78

abcd characters indicate that there are differences in means at the 5% level of significance

The majority of consumers did not express concerns in relation to vulnerable groups, especially not for children and elderly.

Consumers' risk perceptions towards milk safety

The second main question of this study is about consumers' risk perception concerning milk safety. Consumers were asked about their perception of the safety of milk compared to other products such as meat, eggs, fish and fruit (Table 3).

Table 3. Consumers' perceptions of the safety of different products compared to milk (1=less safe, 5=more safe)

Milk	Average Score	Standard Deviation
Meat ^a	3.80	1.32
Fish ^c	3.75	1.46
Eggs ^b	3.70	1.33
Fruit ^{abc}	3.37	1.31

abc characters indicate that there are differences in means at the 5% level of significance

Table 3 shows that consumers consider milk as a safer product than meat, fish, eggs and fruit. Although consumers perceive milk as more safe than other products, the majority of them thinks that it is possible to get sick of milk: 16.2% of the respondents considers that it is possible; 48% thinks possible-but very rarely, and 28.6% believes that it is not possible to get sick of milk consumption. About 7% of the respondents had difficulties answering the question.

Consumers' risk perceptions depend on what kind of contamination is involved. Three main groups like microbiological, chemical and physical contamination can be distinguished. In Table 4 consumers' perceptions of these sources of contamination are presented.

Table 4. Consumers' perception of different sources of contamination (1=not dangerous at all, 5=very dangerous)

Source of contamination	Average Score	Standard Deviation
Microbiological (Salmonella, E. Coli) ^a	2.23	2.04
Chemical (antibiotics, pesticides, dioxin) ^{ab}	2.85	1.97
Physical (parts of glass, wood) ^b	2.08	1.96

ab characters indicate that there are differences in means at the 5% level of significance

As we can see from Table 4, consumers do not perceive the different sources of contamination as serious hazards.

To identify the health effect of different sources of contamination, a list of six possible effects was presented (Table 5).

Table 5. Consumers' perceptions of health effects from different sources of contamination (%)

Sources of contamination	No effect	Sickness (headache; puking)	Indigestion (diarrhoea)	Long – term effect	Death	Other
Microbiological	6.3	34.0	59.2	11.7	13.1	2.4
Chemical	5.0	23.0	22.0	53.5	7.5	2.5
Physical	16.6	10.6	12.6	13.1	5.5	20.6

Concerning microbiological contamination about 60% of the consumers thinks that it can entail to indigestion (diarrhoea), 34% believes that it could lead to a little sickness (headache, puking). With respect to chemical contamination the majority of respondents (53.5%) considers the possible effect to be a long-term effect. With regard to physical contamination 16.6% of the consumers thinks that it is not harmful for their health. Still, 20.6% considers that it can entail to other effects.

Although consumers were not concerned about milk safety risks for vulnerable groups, it is interesting to investigate their perception of the influence of different sources of contamination for these groups.

Table 6. Consumers' risk perceptions of vulnerable groups becoming sick of different sources of contamination (1=not risky, 5=very risky)

	Average Score	Standard Deviation
<i>Microbiological contamination</i>		
Babies (0-3 years) ^{ab}	4.28	2.25
Children (4-12 years) ^{ac}	3.82	2.39
Pregnant women ^c	4.14	2.31
Elderly ^b	3.90	1.98
<i>Chemical contamination</i>		
Babies (0-3 years) ^{de}	4.44	2.21
Children (4-12 years) ^{df}	4.16	2.37
Pregnant women ^{fg}	4.38	2.30
Elderly ^{eg}	3.88	2.19
<i>Physical contamination</i>		
Babies (0-3 years) ^{hij}	3.95	2.44
Children (4-12 years) ^{hk}	3.68	2.55
Pregnant women ^{il}	3.62	2.56
Elderly ^{ijkl}	3.30	2.30

abcdefghijkl characters indicate that there are differences in means at the 5% level of significance

The results show that babies are considered to be more sensitive to different sources of contamination than other groups. Furthermore, consumers consider pregnant women to be more sensitive to microbiological contamination than children. However, children seem to be more sensitive to chemical contamination. Physical contamination is not regarded as a very risky.

Consumers' attitudes towards labelling and certifying organisations

Already many food safety studies have attempted to determine the importance of the labelling of extra-safe products to consumers (Misra *et al.*, 1995). In the questionnaire under consideration, over 70% of the respondents indicated that they strongly agree with the statement that it is necessary to provide the extra-safe milk with a special label, which will distinguish it from other products. About 10% strongly disagreed with the statement, and about 12% expressed their indifference. Respondents were also asked which certifying organisation they trust more (Table 7).

Table 7. Consumers' trusts of different certifying organizations (1=definitely not trust, 5=definitely trust)

	Average Score	Standard Deviation
Government	3.82	1.64
Private organisation	3.96	2.20
Producers	3.99	1.91

Respondents almost equally trust different certifying organisations, i.e. the paired t-test did not show any significant differences in means.

Analyses of willingness to buy and pay of/for extra-safety milk

One of the main research questions of this study was whether consumers are willing to buy extra-safe milk and, if so, how much they are willing to pay for it. Respondents were initially asked whether they would consider purchasing the extra-safe milk. 11% of the respondents answered to definitely buy it, 29.9% would probably buy the extra-safe milk, 40.7% would probably not buy it, and 18.6% answered to definitely not buy the extra-safe milk.

Respondents' answers to the open-question about the price premium they are actually willing to pay for extra-safe milk shows a wide range from "no premium at all" to "Dfl 2.50 additionally". To simplify the analysis 5 price categories were created: (1) Dfl 0.0; (2) Dfl 0.05-0.25; (3) Dfl 0.26-0.50; (4) Dfl 1.00-1.70; and (5) Dfl 1.75-2.50.

There seems to be some inconsistency between "willingness to pay" and "willingness to buy": about 60% of the respondents expressed their unwillingness to buy extra-safe milk, whereas only 42% is not willing to pay a price premium. Nevertheless, in total only 49 respondents were inconsistent.

There are a number of factors which help to explain the differences in expressed “willingness to buy” and “willingness to pay” between individuals. We distinguished two groups of factors: (1) consumers’ risk perception and (2) socio-economic characteristics. Factors of the first group are “Possibility to get sick of milk” and “Consumers’ risk perception of different contamination”. Factors of the second group are “Gender”, “Income”, “Education”, “Knowledge about food safety in general”, “Knowledge about milk safety”, “Children”, “Age” and “Household size”.

Results from the logistic regression show that the model does not fit the data well. Only 17% of the “variation” in the outcome variables is explained by the logistic regression model. Two explanatory variables (“Possibility to get sick of milk” and “Age”) were included in the model by 2 steps (Table 8).

Table 8. Logistic regression model for identifying factors influencing consumers’ willingness to buy extra-safe milk (step 2)

	B	S. E.	Wald	df	Sig.	Exp (β)
Possibility to get sick from milk	0.837	0.299	7.846	1	0.005	2.309
Age			9.199	4	0.056	
20-30 years	1.944	0.904	4.626	1	0.031	6.988
31-40 years	0.996	0.572	3.029	1	0.082	2.707
41-50 years	1.019	0.578	3.110	1	0.078	2.770
51-60 years*	0.011	0.585	0.000	1	0.984	1.012

* last age group (>61) was taken as a base level

The regression coefficient shows that willingness to buy is positively correlated to consumer’s awareness to get sick from consuming milk. The coefficient of first three categories of the variable “Age” (20-30; 31-40; 41-50 years) are statistically significant ($p \geq 0.1$) and positively correlated to willingness to buy.

To evaluate consumer’s willingness to pay, a multinomial regression model with the same factors as for the willingness to buy analysis was used. The model fits the data well, i.e. the Chi-Square coefficient is significant ($p \geq 0.1$). The results of the willingness to pay model are presented in Table 9.

The coefficients of the multinomial regression model need to be interpreted in comparison to respondents who do not want to pay an additional price for extra-safe milk, i.e. the latter group is taken as the base level. Variables that do not have a significant influence on the willingness to pay for extra-safe milk include “Possibility to get sick of milk”, “Danger of physical contamination”, “Gender”, “Education”, “Consumers’ knowledge about food safety in general” and “Consumers’ knowledge about safety of milk”.

Table 9. Results of willingness to pay model

Explanatory variable	-2 Likelihood of Reduced Model	Chi-square	Sig.
Intercept	289.387	0.000	
Possibility to get sick of milk	293.673	4.286	.369
Danger of microbiological contamination to health	301.565	12.178	.016*
Danger of chemical contamination to health	297.950	8.563	.073*
Danger of physical contamination to health	290.693	1.306	.860
Gender	296.660	7.273	.122
Income	321.723	32.335	.009*
Education	305.674	16.287	.433
Knowledge about food safety in general	295.051	5.664	.226
Knowledge about safety of milk	293.222	3.835	.429
Household size	316.278	26.890	.001*
Children	300.240	10.853	.028*
Age	322.789	33.402	.007*

* significant at $p \geq 0.1$

Results of the willingness to pay model by price categories are presented in Table 10. The variable “Danger of microbiological contamination to health” was positively correlated to consumers’ willingness to pay, both for the price categories “Dfl 0.05-0.25” and “Dfl 1.00-1.70”. An opposite result was found for the variable “Danger of chemical contamination to health”, i.e. for the price category “Dfl 0.05-0.25” the correlation coefficient was negative.

Table 10. Results of willingness to pay model by price categories *

Price categories	β	Sig.
<i>0.05-0.25</i>		
Danger of microbiological contamination to health	0.729	.069
Danger of chemical contamination to health	-0.679	.035
Children	1.676	.036
Household size (1 person)	-5.213	.002
<i>0.26-0.50</i>	-	-
<i>1.00-1.70</i>		
Danger of microbiological contamination to health	1.633	.011
Age (41-50 years)	-5.423	.048
<i>1.70-2.50</i>		
Gender (women)	1.348	.072
Age (41-50 years)	-2.103	.069

* all variables are significant at $p \geq 0.1$

The variables “Household size” and “Children” were found to be significantly correlated with the willingness to pay for extra-safe milk. The positive relationship between the willingness to pay and “Children” indicates that consumers with children are more willing to pay a price premium of Dfl 0.05-0.25. Contrary, the negative correlation of the variable “Household size” shows that people living alone less willing to pay an additional price for extra-safe milk. The variable “Age” (41-50 years) was negatively correlated to the willingness to pay, although in the analysis of the willingness to buy this variable was significantly positive (see Table8).

From the tables 9 and 10, it becomes clear that “Gender (women)” is a significant variable. In Table 10 it is even significantly positive correlated with willingness to pay a price premium of Dfl 1.70-2.50 for extra-safe milk. The variable “Income” was significantly related to willingness to pay (Table 9). However, in Table 10 this variable is not significant at all. To investigate the variable “Income” more deeply, a new model was developed with “Income” as a linear function. Results indicate that “Income” has a significantly negative correlation with the willingness to pay for the price category Dfl 0.05-0.25.

Conjoint experiment and cluster analysis

Respondents were asked to rate hypothetical products in terms of the level of likeliness to buy it. Results indicate that the most important factors for consumers’ preference are risk of contamination and presence of the label. For all respondents in the experiment, this attribute accounted for approximately 75% of the difference in preference scores as compared to roughly 25% for price premium. The mean of the Pearson’s correlation coefficient for fit of the main effects model is 0.907, which means that the applied conjoint experiment design fits the data well. Results from the cluster analysis indicate that there are four distinct consumer segments. The conjoint experiment results by segment are given in Table 11.

Table 11. Mean part-worth estimates by segments

Attribute/level	Part-worth			
	Segment 1 Balanced Shoppers (N = 56) ¹	Segment 2 Safety- Seekers (N = 34)	Segment 3 Safety- Indifferent (N = 47)	Segment 4 Extreme- Safety Seekers (N = 62)
<i>Price premium</i>				
No price premium	13.78	1.89	2.30	2.60
Dfl 0.20 premium	-3.79	-.54	-8.87	1.03
Dfl 0.40 premium	-9.99	-1.35	-13.43	-3.63
Relative factor importance, %	29.11	9.15	50.39	10.48
<i>Risk of contamination and label</i>				
Risk of microbiological contamination and no label	-21.38	-20.25	-9.70	-33.11
Risk of chemical contamination and no label	-22.82	-20.04	-11.39	-34.27
Risk of chemical contamination and with label	-19.07	-19.79	-6.51	-32.36
No risk at all and no label	25.62	-4.30	10.38	46.49
No risk at all and with label	37.65	64.38	17.22	53.25
Relative factor importance, %	70.89	90.85	49.61	89.52

Note: sample size = 199

¹ N represents the number of respondents in each segment

Examination of the part-worth and relative importance of factors for each segment indicates that consumers in each segment value product characteristics very differently.

Three segments attach the highest importance to the second factor, (i.e. chance of contamination and label), as indicated by the relative factor importance.

The first market segment can be called “Balanced Shoppers”. It is representing 28% of the respondents. They are concerned about the risk from all sources of contamination and prefer to consumer milk with a special label. This factor has a relative importance of 70.89%. Concerning price premium, the part-worth scores indicate that the respondents are not willing to pay an additional price for extra-safe milk.

The “Safety-Seekers” segment, representing 17% of the participants, values the second factor also higher than the “price premium”. But in this segment respondents evaluate “no risk at all and label” very high. It means that they really prefer to consume extra-safe milk (without any possible risk of contamination) with a label of certifying organisation that they trust. With respect to the price premium, this segment can be characterised as a segment of people that care less about price and prefer to pay an additional price to avoid possible risk.

The third segment is “Safety-Indifferent”, representing 24% of respondents. This segment values the “price premium” factor as very important, as indicated by the relative factor importance of 50.39%. The respondents from this sector are price sensitive. They are not willing to pay an additional price premium for extra-safety milk. The part-worth scores of the second factor also indicate that the respondents in this segment worry less about the risk of contamination than others.

The fourth market segment is labelled the “Extreme-Safety-Seekers”. It comprises about 31% of the respondents. This segment also values the second factor most highly. The part-worth scores in this segment are very similar to the second cluster. However, consumers of this segment are somewhat more concerned about the risk of contamination.

DISCUSSION AND CONCLUSIONS

This study has extended earlier researches documenting consumer concerns over food safety issues. The main research goal was to investigate consumers’ risk attitudes and risk perceptions concerning milk safety and to estimate their willingness to pay for extra-safe milk.

Consumers’ risk attitudes and risk perceptions

Consumers’ risk attitudes and risk perceptions are important determinants of the willingness to pay for food safety improvements. In most literature, risk attitudes and risk perceptions are lumped together under the title of risk. The present research,

however, examines the influence of consumers' risk attitudes and perceptions separately.

Contrary to findings from other studies, consumers did not express their concerns about the risk of vulnerable groups becoming sick from consuming milk. Since milk is perceived as a very safe product, consumers consider that possible foodborne accidents can happen - but very rarely. Comparing consumers' perceptions of different sources of contamination in general and with respect to vulnerable groups of consumers shows following: although consumers did not perceive the different sources of contamination as dangerous, they do perceive that babies are more sensitive to it than other groups. Also, consumers considered microbiological contamination to be more risky for pregnant women than for children. Children are perceived to be more sensitive to chemical contamination. Such divergence in results may be explained by two reasons. First, there is the "nothing can happen to me"- "everything will happen to everyone else" attitude of people. Second, people may not be concerned about risks in general, but, when asking them about specific sources of risk they start to worry.

Willingness to buy and pay analyses

One of the main research questions of this study was whether consumers' are willing to pay for extra-safe milk. This study supports the results of previous food safety studies showing that consumers are willing to pay a price premium to the traditional purchase price to avoid some perceived risks. In our study 58% of the respondents was willing to pay a price premium.

Results indicate that there is a great diversity in "willingness to pay" for food safety improvements. Women are more willing to pay an additional price of Dfl 1.70-2.50 than men. This high amount can be explained by two reasons. First, as a lot of studies have already documented that women are typically more concerned about safety, because they are often responsible for the food safety and health issues of the family (Lin and Milon, 1995; Henson, 1996). Second, since the price premium of Dfl 1.70-2.50 is significantly higher than the real price of milk (i.e. Dfl 1.50 per litre), it might be the case that female respondents misinterpreted the valuation question by giving the *full* price that they are willing to pay.

Households with children are more concerned about the safety of milk than households without children. Therefore, they expressed their willingness to pay for extra-safe milk. Our findings that households with children only willing to pay the

smallest price premium (Dfl 0.05-0.25) may be explained by the fact that they already have many other expenses.

Conjoint analysis compared to willingness to pay analysis

Although, in general, willingness to pay and conjoint analyses give the similar results, differences were found. The main difference is that the prices of the willingness to pay analysis are much larger than the price levels in the conjoint analysis.

Differences can probably be explained by the fact that consumers perceive an open-ended willingness to pay question and a conjoint experiment design as two totally different tasks. In the open-ended question, consumers are able to express their opinion freely, but they may not sufficiently consider their budget constraint.

Another problem is that consumers expressed their concerns about the sources of contamination different for the conjoint task than for the willingness to pay task. In the willingness to pay analysis we found that respondents are less willing to pay an additional price, since they do not perceive chemical contamination as dangerous to health. However, the conjoint analysis shows that chemical contamination was viewed as a serious hazard.

Recommendations

The findings of this study are useful to the dairy production chain in the Netherlands. Since respondents showed their worries about vulnerable groups of consumers and since they expressed their willingness to pay for extra-safe milk, there may be an opportunity to develop “new” kinds of milk or to improve existing ones.

References

- Akgungor, S., Bulent, M., Abay, C., (1999). “Consumer Willingness to Pay for Reduced Pesticide Residues in Tomatoes: The Turkish Case”, Paper prepared for Presentation at the Annual Meeting of the American Economics Association, Nashville, Tennessee, 8-11 August.
- Baker, G.A., Crosbie, P.J., (1993). “Measuring Food Safety Preferences: Identifying Consumer Segments”, *Journal of Agricultural and Resource Economics*, 18, pp. 277-287.
- Baker, G.A., (1999). “Consumer Preferences for Food Safety Attributes in Fresh Apples: Market Segments, Consumer Characteristics, and Marketing Opportunities”, *Journal of Agricultural and Resource Economics*, 24(1), pp. 80-97.

- Buzby, J.C., Fox, J.A., Ready, R.C., Crutchfield, S.R., (1998). "Measuring Consumer Benefits of Food Safety Risk Reductions", *Journal of Agricultural and Applied Economics*, 30 (1), pp.69-82.
- Henson, S., (1996). "Consumer willingness to pay for reductions in the risk of food poisoning in the UK", *Journal of Agricultural Economics*, 47 (3), pp. 403-420.
- Lin, C.-T.J., Milon, J.W., (1995). "Contingent valuation of health risk reductions for shellfish products", in Caswell, (ed.), *Valuing Food Safety and Nutrition*, Westview Press, Boulder, CO, pp. 83-114.
- Misra, S.K., Stanley, M.F., Huang, C.L., (1995). "Contingent valuation of health risk reductions for shellfish products", in Caswell, (ed.), *Valuing Food Safety and Nutrition*, Westview Press, Boulder, CO, pp. 435-455.
- Senauer, B., Asp, E., Kinsey, J., (1991). "Food trends and the changing consumer", Eagan, St. Paul
- Steenkamp, J.-B.E.M., (1990). "Conceptual Model of the Quality Perception Process.", *Journal of Business Research*, 21, pp. 309-333.